

ENVIRONMENTALLY FRIENDLY TRENDS IN POWER GENERATING INDUSTRY

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An economy is sustainable only if it respects the principles of ecology. These principles are as real as those of aerodynamics. If an aircraft is to fly, it has to satisfy certain principles of thrust and lift. So, too, if an economy is to sustain progress, it must satisfy the basic principles of ecology. If it does not, it will decline and eventually collapse. There is no middle ground. An economy is either sustainable or it is not. Today's global economy has been shaped by market forces, not by the principles of ecology. An economy is sustainable only if it respects the principles of ecology. These principles are as real as those of aerodynamics. If an aircraft is to fly, it has to satisfy certain principles of thrust and lift. So, too, if an economy is to sustain progress, it must satisfy the basic principles of ecology. If it does not, it will decline and eventually collapse. There is no middle ground. An economy is either sustainable or it is not.

The key to restoring climate stability is shifting from a fossil-fuel-based energy economy to one based on renewable sources of energy and hydrogen. Advancing technologies in the design of wind turbines that have dramatically lowered the cost of wind-generated electricity to the point where it can be used to produce hydrogen from water, along with the evolution of fuel-cell engines, have set the stage for a dramatic restructuring of the world energy economy. The good news is that this shift is under way. The bad news is that it is not happening nearly fast enough to avoid a climate-disrupting buildup in atmospheric CO₂ levels. The dynamics of consumption by source we can see from the table (See Table 1)

In 2001 alone it grew by a robust 36 percent. And in the United States, wind electric generating capacity jumped by a phenomenal 66 percent in 2001. Solar cell sales, growing by 21 percent a year from 1995 to 2001, are likely to grow even faster in the years ahead. Once economically competitive only when used in satellites and pocket calculators, solar cells are now becoming competitive for residential lighting in Third World villages not yet connected to the grid. In many countries, if getting electricity to villages means building both a centralized power plant and a grid to deliver the power, it is now often cheaper for families simply to install solar cells. In Andean villages, for example, the monthly installment cost (with a 30-month payment period) on an array of solar cells to provide lighting is comparable to the cost of candles. A similar price relationship exists for the more remote villages in India that depend on kerosene lamps for light.

Another renewable source, one with a largely overlooked potential, is geothermal energy, which is growing at 4 percent a year. This is a vast resource and one that is likely to figure prominently in the energy economies of the Pacific Rim, particularly where widespread volcanic activity indicates that geothermal energy is close to the earth's surface. The western coasts of South America, Central America, and North America have an abundance of geothermal energy. Perhaps the geothermally richest region is the western Pacific, including Indonesia, the Philippines, Japan, and the eastern and southern coasts of China. Another rich region is the Great Rift Valley, which stretches through East Africa up into the Middle East. In fact, the entire eastern Mediterranean is geothermally well endowed. Some countries have enough geothermal energy to meet all their electricity needs.

Hydroelectricity, which supplies over one fifth of the world's electricity, has expanded by 2 percent a year since 1990. In contrast to the other renewable sources of energy, the growth in hydropower is losing momentum as suitable sites for new dams are scarce and as public opposition mounts to large-scale inundation of land, the associated displacement of people, and the disruption of ecosystems.

Fortuitously, the fastest-growing fossil fuel is natural gas, which is the obvious transition fuel from a carbon-based energy economy to a hydrogen-based one. The natural gas infrastructure, including distribution networks and storage facilities, can easily be adapted for hydrogen as gas reserves are depleted.

The new century is bringing new directions in the world energy economy. The last century was characterized by the globalization of energy as oil emerged as the leading energy source. Indeed, the entire world became heavily dependent on one region, the Middle East, for a disproportionately large share of its energy. Now as the world turns to wind, solar, and geothermal as the primary energy sources and to hydrogen as an end-use fuel, the energy economy is localizing, reversing the trend of the last hundred years.

Table 1. Trends in Energy Use, by Source, 1995-2001

Energy Source	Annual Rate of Growth (percent)
Wind power	+ 32.0
Solar photovoltaics	+ 21.0
Geothermal power 1	+ 4.0
Hydroelectric powre	+ 0.7
Oil	+ 1.4
Natural gas	+ 2.6
Nuclear power	+ 0.3
Coal	- 0.3